Adopt sustainable development principle in aquaculture

The full socioeconomic benefits of coastal aquaculture development can only be achieved by adopting the principle of sustainable development, which is defined by FAO as:

"Sustainable development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable"

Inadequate planning and inefficient management of coastal aquaculture has resulted into serious socioeconomic consequences. Some examples are:

- Large-scale mangrove conversion for shrimp and fish farming has displaced rural communities which traditionally depended on mangrove resource for their livelihood. In addition to the negative social consequences, the cost of disrupting the ecosystem includes coastal erosion, saltwater intrusion into groundwater and agricultural land, acidification, and a reduction in a range of goods and services produced from the mangrove forests.

- The land subsidence (sinking) in a Taiwan province caused by excessive pumping of groundwater for shrimp and eel culture resulting in significant social costs in terms of salinization of underground water and land due to salt-water intrusion (which reduce agricultural productivity), reduction of freshwater supply (for agricultural, industrial and municipal/domestic uses) and damage to transportation and other infrastructure.

- Financial losses to the Norwegian cage-farming industry due to outbreaks of *Hitra* disease.

- The public health consequences of red tide outbreaks in areas where shellfish are grown.

Some of these problems do not reflect the true cost of resource depletion and environmental change. For example, the true cost related to the deterioration of coastal water quality are not usually borne by coastal aquaculturists but often spread to other users of coastal waters.

The solution to these problems requires policy intervention at national and local level, particularly to address the issues of common property rights and economic incentives and deterrents needed to minimize ecological change. The use of common resources such as the water and public land for coastal aquaculture development should take into account traditional use and the potential consequences of over-use.

The idea of economic incentives and deterrents such as subsidies and taxes is to encourage aquaculturists to make more efficient use of resources and take full responsibility for mitigating or minimizing ecological changes caused by their culture operation. For example, if aquaculturists had to pay for the scarcity value of water and environmental cost of land subsidence the industry would have developed differently and may have had less environmental impact.

Policy intervention may also include a requirement for regulatory control of the establishment, operation and management of coastal aquaculture. It is clear that to ensure sustainable development, the positive and negative socioeconomic effects of coastal aquaculture, including its ecological effects, must be evaluated in the context of the society's social and economic goals. Analysis of any coastal aquaculture project should take into account both the local and the wider social and ecological costs and balance this against the benefits and costs of the project, which should not be undertaken unless there are net social benefits.

The assessment of wider environmental impacts (socioeconomic and ecological) is needed in an evaluation of the social benefits. The impacts have to be identified, measured and where possible, a monetary value placed on them so that they can be included in a formal analysis. Quantitative evaluation of the impacts of aquacutlure on the environment has only recently been seriously attempted, and most of the biophysical relationships involved have yet to be

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The resources available to ensure the continuance of life on earth are finite. Any resource can only serve a limited number of purposes at the same time and place. This is particularly true of water which is a fundamental requirement not only for aquatic but also for terrestrial organisms...

... Aquaculture production is in great demand, but it must not be achieved without due regard to safeguarding our basis of survival..

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form of exclusive use rights, and adopt more innovative management measures.

Adopting access controls can lead to several problems. One is the general allocation of exclusive use rights - essentially a distribution of wealth would generally have to be made at a political level. Another is determining where the management functions are best fulfilled and relating the role of the government with the fishers as a group.

Adopting new management measures thus lead to increased understanding of biological resources in the context of their environment.

More attention is needed on the social and economic factors governing the behavior and strategies of those using the resources.

Research has intensified and developed new culture systems and made a significant contribution to tropical aquaculture. It should, however, expand on the productivity of ponds in inland farming systems and pay more attention to understanding how aquaculture can best be integrated with existing agricultural and forestry practices. Lack of information hindered effective development and management of fisheries although improvements can be made using available information.

Source: Study of International Fisheries Research: In: ***Fish for the Future - A Summary Report 1983.***

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firmly established. Most research on the environmental impacts of aquacuture has been focussed on intensive production systems for finfsh and molluscs but little is known of shrimp culture.

Sustainable aquaculture needs adequate interaction among the social, economic and ecological changes, which accompany development. This can be achieved through an integrated approach to planning and management of coastal aquaculture.

Source: GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Pollution), Reducing environmental impacts of Coastal Aquaculture. Rep. Stud. GESAMP (47):35p.1991.